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Development of a Risk Model as a Policy and Procedure for the Madison Fire Department

David F. Peterson

Madison Fire Department

Madison, Wisconsin

Abstract

The problem for the Madison Fire Department was that it did not have a policy and procedure for a risk model to be considered on all emergency responses. Personnel did not have access to a risk model, or a concise summary statement pertaining to risk assessment, in which to base all of their strategic and tactical decisions. Furthermore, there were no current MFD standard operating practices, or standard operating guidelines that pertained to, or addressed a risk model. The purpose of this research was to develop a policy and procedure for the Madison Fire Department that identified a risk model that should be considered on all emergency incidents.

Research addressed the following questions: What, if any, state or national guidelines address a risk model? What, if any, private U.S. emergency services organization's policy or procedures address a risk model? What, if any, private organization's policy or procedures address a risk model? What, if any, public U.S. emergency service organizations address risk vs. models in their policy and procedure? And, What, if any, is the Madison, Wisconsin, Fire Department's conception and application of a risk model?

This applied research project used the action research method to develop and produce a risk model policy and procedure that would be considered on all emergency incidents. Numerous

risk models were researched from private and public sources and were used to formulate the policy and procedure. Research revealed that all known risk models pointed back to one common source. Additionally, department personnel were queried regarding their awareness and use of a risk model in their everyday tasks. The final policy and procedure can be found in Appendix E.

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Introduction

Emergency services response is a high-risk endeavor! It is a well-known fact that nearly 100 firefighters are killed annually with thousands more injured (Peterson, 21st Century Firefighting Status Check: March of the Lemmings?, 2009). These deaths and injuries are the result of responding to the emergency, operating on-scene, and even from training for emergencies. Risk is a constant in all of these activities and risk management should consequently be factored into all firefighter operations. Correspondingly, and in order to affect firefighter safety, a risk model should be utilized by firefighters in response to all hazards and fire department leadership should ensure its strict compliance. It is quite possible then, for this trifecta of risk model utilization, firefighter safety, and leadership, to positively impact the annual firefighter death and injury statistics.

This paper will address the general lack of understanding among firefighters of risk assessment models and methods of applying risk reduction concepts at all emergencies through the use of an accepted risk model. This issue is critical to the health and safety of firefighters as there has been numerous

case studies where firefighters were killed or injured because of not properly assessing the risk of the situation before engaging operations. Additionally, because of a fire service culture of fast responses and over-aggressive operations, the application of a risk model should help to slow responders down so they more fully absorb the danger signs that are usually apparent at emergencies.

The problem that this applied research project (ARP) will address is that the Madison, Wisconsin, Fire Department (MFD) does not have a policy and procedure for a risk model to be considered for all emergency responses. Personnel do not have access to a risk model, or a concise summary statement pertaining to risk assessment, in which to base all of their strategic and tactical decisions. Furthermore, there are no current MFD standard operating practices, or standard operating guidelines that pertain to, or address a risk model. For the purpose of this ARP the term “risk model” will be used to describe a mental model or short statement in which responders can use to assess risk factors at any emergency during initial size-up.

Risk models are succinct guidelines in which to compare the situation at hand and make better response decisions based on a short assessment. Effective risk models contain brief statements

that are easily understood and can even be easily memorized for field use. This ARP will use risk model synonymously with other similar terms such as: risk vs. reward, risk assessment, risk management, risk management profile, and risk/benefit analysis. One other term, “rules of engagement”, will be referred to for procedure development as they add depth to the risk model analysis.

The purpose of this research is to develop a policy and procedure for the Madison Fire Department that identifies a risk model that should be considered on all emergency incidents. In the simplest terms, firefighters need to read the signs of safety upon arrival at every emergency and then react accordingly. This entails recognizing standard factors based on initial size-up, applying a simple risk analysis, and then applying an appropriate strategy. This analysis is a process that is assessed early and often throughout the emergency phase.

The research questions are: What, if any, state or national guidelines address a risk model? What, if any, private U.S. emergency services organization’s policy or procedures address a risk model? What, if any, private organization’s policy or procedures address a risk model? What, if any, public U.S. emergency service organizations address risk vs. models in their policy and procedure? And, What, if any, is the Madison,

Wisconsin, Fire Department's conception and application of a risk model?

This applied research project will use the action research method with the intent being to develop and produce a risk model policy and procedure that should be considered on all emergency incidents. The final policy and procedure can be found in Appendix E.

Background and Significance

The city of Madison is a south-central Wisconsin city with 232,000 residents that is also a rapidly growing capitol city that currently covers 75 square miles. Located within Madison, the University of Wisconsin's main campus adds another 42,000 students and 12,000 staff to the city's population during school sessions. Added to these numbers there are another 80,000 workers who commute into Madison each day.

The Madison Fire Department (MFD) is a full-time department that protects the city with 337 total personnel, 320 of them responding from 12 fire stations in the city. The fire department staffs 74 suppression personnel daily on nine engines, four ladders, eight medic units (ambulances) and one command vehicle. Other vehicles are staffed when needed and they are two hazardous materials response vehicles, one heavy urban response team vehicle, one squad, one S.C.U.B.A. (self-contained

underwater breathing apparatus) vehicle, and several trailer units with specialized capabilities.

The current firefighting practice of the MFD is to rapidly respond to fire related incidents and aggressively fight fires in the offensive mode whenever possible. Observations by this researcher, a former training division instructor, is that fire personnel respond, with good intentions, too fast to all emergencies and do not conduct adequate situation size-ups that include should risk assessments. This behavior is problematic and can be addressed best through the development of a comprehensive risk model policy and procedure. Effective training sessions, both didactic and also field sessions, based on the policy and procedure can then start to change responder behavior towards a more deliberate, slower, and consequently safer response.

The concept of slowing responders down has been discussed for quite some time. Sendelbach (2003) outlines a 10 step action plan that stresses the need to slow down at emergencies in order to better assess risk to responders. He writes that firefighters are so action oriented that they may miss the big picture. Emery (2008) also stressed that there is nothing fast concerning safe firegrounds and that the term “fast attack” should be deleted from firefighter terminology. He stresses that fireground

decisions need to be based on comprehensive risk assessments. Peterson (2009b) wrote that “speed kills” and by responding in a fast mode responders miss important signs on the fireground.

Probably the most tragic incident that caused a major fire department to reassess its aggressive nature at structure fires occurred in Houston. Unfortunately, the premature deaths of two firefighters led to high level discussions with senior staff and that resulted in 10 guidelines being issued to the entire fire department (Thompson, 2009). Perhaps the biggest message provided through the senior staff’s guidance was to slow down and make good decisions.

Two important national publications also report the significance of responding too fast along with risk management guidance. In a National Institute of Safety and Health (NIOSH) alert (2009), in order to avoid firefighter tragedies in the future the following recommendations were made: fire departments should develop and enforce risk management plans, policies, standard operating procedures, standard operating guidelines for risk management, fire personnel need to be trained on those plans, and that offensive interior fire operations should not be conducted in vacant or structurally unsound buildings. In a United States Fire Administration (USFA) publication (2008), 25% of respondents in a questionnaire given to 364 firefighters

stated that over-aggressiveness was a primary safety issue. An interesting side note was that 45% of these firefighters also stated that poor training was also a safety concern. Citing this issue, the USFA stated that objectives to address these concerns were to ensure organizations not to take unnecessary actions when lives or property cannot be saved, and, to properly train firefighters to avoid being overly aggressive. All of these concerns and issues can best be addressed through a risk model policy and procedure and then effective training.

Another aspect of changing behavior rests with the culture that the fire service has developed over many years and how leadership principles can address that change. While change itself is a very involved topic and a science by itself, both the Executive Development and Executive Leadership courses within the National Fire Academy's Executive Fire Officer Program (2009) address it through leadership principles. In their book, Leadership on the Line (Heifetz, 2002), the authors suggest looking at change through technical or adaptive aspects. That is, technical change can most efficiently be handled through the issuance of a policy, decree, or official statement that directly addresses what is needed to rectify a situation. An example is a problem that concerns how to properly start a chainsaw. The technical solution is to issue recommended

guidelines from the manufacturer on the proper starting and operating procedures. The problem is solved and the change is implemented simply and quickly.

Adaptive change is more difficult however. The authors recommend that issues that involve humans and change take more time (Heifetz, 2002). This type of change requires patience and it will not happen overnight. Consequently, it takes effective leadership to apply adaptive change. An example is change that would require firefighters to stop at all red lights and stop signs while responding to emergencies with emergency lights and siren. Because this requirement is new and requires a behavior change among the drivers it will require adapting to new behaviors. Experience has shown that even with new policies and training that supports the new behaviors that change is hard and not readily accepted.

Adaptive leadership is dangerous then because it is dealing with people who feel that something is being taken away from them (Heifitz, 2002). In essence, people are not so upset by the change as much as they are by their loss (Heifitz, 2002). This is the real issue. Emerson once wrote that “People only see what they are prepared to see” (Thorpe, 2000), and in light of this leaders do well to define the new realities and show the followers why the new way is important. That is the challenge

here by developing and implementing a new policy and procedure that issues a new paradigm for emergency response.

Leadership, then, becomes important in these endeavors that attempt to change a current practice, such as responding too fast or aggressively, and that is what Executive Leadership impresses upon learners. It also taught that sometimes leadership needs to be courageous in that leaders have to show the way and also exert their best influence on followers in order to affect change. For these reasons, this ARP is significant to the Madison Fire Department.

Brunacini (1985) clearly showed why comprehensive policies are in firefighter's best interest when he stated;

> "When everyone is operating within a format structured by standard operating procedures, surprises are eliminated and everyone has a good idea of what should be happening, who should be doing what, and how it should be done."

In essence, then, policy and procedures tend to reduce confusion, increase safety, and succeed in getting responders on the same page.

The MFD mission is simply one of public safety and it does so with innovative thinking and effective approaches to emergency services. Consequently, each fire department employee is challenged to participate in making positive changes (Madison

Fire Department, 2006). The intention of this ARP is to meet the challenge in making positive changes and also show meaningful and sustained leadership by offering an effective policy and procedure.

In respect to the United States Fire Administration's (USFA) mission statement of fostering a solid foundation in prevention, preparedness, and response by providing national leadership to local fire and emergency services (United States Fire Administration, 2009), this ARP will explore the problem that has been presented and how to safely manage it by risk management concepts. It is the intent to prevent loss of life, both civilian and fire service, through this research and subsequent control strategies. This ARP will also address the USFA mission statement which is to reduce life and economic losses due to fire and related emergencies, through leadership, advocacy, coordination, and support (United States Fire Administration, 2009). This ARP will also address the following USFA operational objective; to respond appropriately in a timely manner to emerging issues and reduce the loss of life from fire of firefighters (National Fire Academy, 2009).

This ARP also addresses the goal of the fourth course in the Executive Fire Officer Program (National Fire Academy, 2009), Executive Leadership: to develop the ability to conceptualize and employ the key processes and interpersonal skills used by

effective executive-level managers. Perhaps the most important process is that of a leader, therefore, the development of a risk model policy and procedure is a leadership instrument in that it shows others the way. As a logical extension to this goal, this ARP will address the baseline safety aspects that a risk model assessment to a structure fire, and other emergencies, has for firefighters, and, how this component of a fire response is a critical factor in fire department operations.

It has been estimated that the loss of a firefighter's life is valued at a minimum of 1.5 million dollars; both in direct and indirect costs (see Appendix A). Just one firefighter lost in a community has numerous, long-lasting consequences such as the emotional and psychological burden on the firefighter's family, friends, and neighborhood along with the local fire department and community. This research and subsequent policy and procedure can help to avoid firefighter death, (and even injuries), as a result of emergency operations.

This research is also congruent with the 16 firefighter life safety initiatives that have been identified by the Firefighter Life Safety Summit that was hosted by the USFA and the National Fallen Fire Fighter Foundation (National Fallen Firefighters Foundation, 2009). Namely, initiative 1 advocates the need for a cultural change in the fire service related to safety, and

initiative 3 focuses on risk management planning during incidents including strategic, tactical, and planning responsibilities.

It is also the intent of this research to share information and strategies with other EFOP participants and other fire departments in the country because the concerns cited here will likely be encountered elsewhere. All of the above is value-based, relevant, and significant to the MFD.

Literature Review

A literature review on this subject matter was conducted at the National Fire Academy's Learning Resource Center and at Madison Area Technical College's (MATC) Fire Service Education Center in Madison, Wisconsin. Other sources of information were Madison Fire Department official documents and various websites on the Internet.

A search of several literature sources revealed sources of risk models including a *Fire Engineering* magazine article by a Fire Department of New York officer (Marsar, 2009) did discuss the National Fire Academy (NFA) risk model, called the "risk vs. reward" model, and its guidance: "Risk a lot to save a lot, Risk a little to save a little, Risk nothing to save nothing." The author used this model to assist firefighters with determining a fire victim's survival profile. He concludes that "we should all adopt it" (Marsar, 2009).

Another trade magazine article, found in *Fire Engineering* in a section called “The Roundtable”, offered helpful information on risk models and risk assessment (Coleman, 2001). In this format eight knowledgeable and experienced fire service professionals weighed in on the concept of “rules of engagement”. While most of the respondents reported that they use and follow basic firefighting safety guidelines only 2 of the 8 (25%) specifically use a risk model such as the NFA model. One of the departments, Phoenix, stated that they have used a variation of the NFA model since 1986.

The PFD model (Coleman, 2001) is as follows;

1. What is the survival profile of any victims in the involved compartment?
2. We WILL NOT risk our lives at all for a building or lives that are already lost.
3. We may only risk our lives a LITTLE, in a calculated manner, to save SAVABLE property.
4. We may risk our lives a lot, in a calculated manner, to save SAVABLE LIVES.

The Fire Engineering article also cited the NFA risk model along with other useful information that enhances the risk model. As was discussed earlier in this ARP, the rules of engagement will

be used to assist in developing the procedures that guide responders on the risk model policy.

The United States Fire Administration (1996) published a guidance document that defines risk, outlines how to write risk management plans, and how to control risk in practical terms. Risk is defined as “the possibility of meeting danger or suffering harm or loss, or exposure to harm or loss (United States Fire Administration, 1996). The guidance goes on to frame risk by dealing with the probability of an undesired event, the consequences, and the severity of the loss that occurs. This is useful information to better understand how a risk model can assist firefighters in avoiding risk. The guidance also details how risk can be evaluated and controlled through administrative measures such as standard operating procedures, training, and work practices. Risk can also be addressed through engineering controls such as shielding and also through protective equipment such as hard hats, gloves, and other clothing (United States Fire Administration, 1996).

One other document that was published by the NFA also stresses the need for both incident commanders and company officers to conduct risk assessments at emergencies (National Fire Academy, 1993) (Brunacini, The Incident Commander's Role in Save Our Own, 2006). This training manual states that “the incident commander must determine if risks taken are worth the

benefits gained.” It goes on the say, “Company officers must also make risk/benefit judgments.” (National Fire Academy, 1993) This manual has been used by numerous U.S. fire departments for their on-scene emergency operations since it was published.

Assorted fire service books were found with risk model information. Hoff and Kolomay (2003) briefly discuss risk vs. benefit in a section concerning firefighter safety. However, no risk model or other guidance is offered. In Air Management for the Fire Service (2008), risk is only addressed as an assigned duty of the incident commander who recognizes and manages risk. In Firefighting Strategies and Tactics (2001) the authors offer the following risk/benefit philosophy; “We will risk a lot to save a lot, We will risk little to save a little, We will risk nothing to save nothing.” Also, Dodson (1999) summarizes NFPA risk management standards by stating that risk guidelines can assist in providing decisions. Dodson summarizes the risk guidelines the following way;

1. Activities that present a significant risk to the safety of members shall be limited to situations in which there is a potential to save endangered lives.
2. Activities routinely employed to protect property shall be recognized as inherent risks to the safety of members, and actions shall be taken to reduce or avoid those risks.

3. No risk to the safety of members shall be acceptable when there is no possibility to save lives or property.

Dodson (1999) continues by shortening the statements for ease of remembering; “Risk a life to save a life, Take a calculated and weighted risk to save valued property, Take no risk to save what is lost.” Dodson also offers additional considerations that can assist with procedural development. He clarifies that risking a life is not the same as “sacrificing” the life of a firefighter. Responders should not look at risk as a one for one exchange. Dodson (1999) also offers the following questions to serve as risk consideration primers;

1. What is the worst possible thing that can happen here?
2. What is the likelihood of it happening?
3. How severe will the injury be?
4. Can any intervention be employed to reduce risk?
5. Have our people ever tried this before and what was the result?

Brunacini (2002) adequately covers risk management as a function of command by clearly stating the following risk model; “We will risk a lot to protect a savable life, We will risk a little to protect savable property, We will not take any risk to protect lives or property that are already lost.” Brunacini also offered another variation of his own risk model in a 2006 speech

at the Public Entity Risk Institute (PERI). Brunacini (2006) stated, “We will take a significant risk to protect a savable life, a little very controlled risk to protect savable property, no risk for what is already lost.” This latter risk model added a few adjectives that better define the risk analysis process. In an earlier book, Brunacini (1985) shared several risk management axioms that are worth listing here;

1. Savable victims are the absolute number one priority of all fireground operations.
2. Victims who are already dead are not savable.
3. Victims inside fully involved fire areas are generally dead within less than one minute.
4. No property is worth the life of a firefighter.
5. Contents that are already on fire have very little salvage value.
6. If we save an abandoned building today, someone will burn it tomorrow.
7. A lot of stuff we risked our lives for on Saturday night gets loaded into an old dump truck and hauled off Monday morning.
8. Beware of crews that always attack and know only one pace-full speed ahead.

In a phone interview with Brunacini (June 27, 2010) he stated that the genesis for his risk model began in the early 1980's while he was writing his first book for the fire service on fire command. Brunacini said that his risk model was first published in 1984 in various fire publications. His risk model was also used within his own fire department in 1986 (Brunacini was chief of the Phoenix Fire Department from 1978 to 2006). His risk model was also used as the basis for the risk statements found in the first published NFPA 1500 standard (2007) that was issued in 1987. Finally, regarding the similarity of risk statements between his own and the National Fire Academy version, Brunacini stated that he had never been contacted by the NFA in order to use his risk model. He added though, that he is happy that they could use a very similar risk model for their efforts.

While on campus at the National Fire Academy, the Learning Resource Center (LRC) was accessed and a search for the following keywords was conducted: "risk/benefit analysis", "risk vs. benefit models", "risk assessment models", "risk assessment", "risk benefit", "risk benefit model", "risk-reward", and "risk/benefit model", The term "rules of engagement" did emerge, however, as being associated with risk models.

A review of Wisconsin state law found that the Wisconsin Department of Commerce governs fire department operations. Specifically, Comm 30 - Fire Department Safety and Health Standards (Department of Workplace Development, 1999) covers items that enhance and maintain firefighter safety. Wisconsin Comm 30 does mention risk evaluation in Subchapter IX – Emergency Operations (30.14). It states under rescue of members, “At emergency operations, the officer in command shall evaluate the risks to fire fighters and, if necessary, request that at least basic life support personnel and patient transportation be available.” Additionally, a review of federal Occupational Safety and Health Administration (OSHA) regulations were also reviewed for risk model guidance applicable to fire fighting. Namely, the OSHA regulations for fire brigades (2010) found in 29 CFR 1910.156.

Voluntary standards on the topic of risk models were also researched with National Fire Protection Association (NFPA) documents. NFPA 1500 (2007) is a document that guides fire departments in how to comply to minimum safety and health concepts and requirements. Its basic concept is to promote safety in the fire service and prevent firefighter deaths and injuries. One of NFPA 1500’s requirements is to develop a written risk management plan that includes criteria for

effective risk assessments. Firefighters can use this risk based criteria to make better tactical decisions at any emergency.

Within the NFPA 1500 (2007) standard the following explains the basic principles involved in applying the risk versus benefit analysis:

> NFPA 1500-8.3.2 The concept of risk management shall be utilized on the basis of the following principles:
>
> (1) Activities that present a significant risk to the safety of members shall be limited to situations where there is a potential to save endangered lives.
>
> (2) Activities that are routinely employed to protect property shall be recognized as inherent risks to the safety of members, and actions shall be taken to reduce or avoid these risks.
>
> (3) No risk to the safety of members shall be acceptable when there is no possibility to save lives or property.
>
> (4) In situations where the risk to fire department members is excessive, activities shall be limited to defensive operations.

Additionally, similar statements concerning risk can be found in other NFPA standards such as NFPA 1521-Standard for Fire Department Safety Officer (2008), and NFPA 1561-

Standard on Emergency Services Incident Management Systems (2008).

Electronic sources of information pertaining to risk models were revealed via the Internet. One major U.S. fire department, the Phoenix (Arizona) Fire Department, has a comprehensive risk model that was first issued in 1986. The Phoenix Fire Department (2001) calls it a “risk management profile” and it is as follows; “We Will risk our lives a lot, in a calculated manner, to save SAVABLE lives, We Will risk our lives a little, in a calculated manner, to save SAVABLE property, We Will Not risk our lives at all for lives or property that are already Lost.”.

Another fire department from Fulton County, Georgia (2003), has issued guidance on considering risk called “rules of engagement”. This standard operating procedure states the following;

> 1.1.1. No property is worth the life of a member of the Fire Department.
>
> 1.1.1.1. Fire department members shall NOT be committed to interior firefighting operations in any structure that is obviously abandoned, derelict, known or reasonably believed to be unoccupied.
>
> 1.1.1.2. Fire department members shall NOT make entry into a hazardous environment without the material or substance being identified for other than life saving

purposes and then only with appropriate training and equipment.

1.1.1.3. Fire department members shall NOT make entry into an unshored collapsed structure or trench for other than immediately life safety reasons, and then only with appropriate training and equipment.

1.1.2. A basic level of risk is recognized and accepted, in a measured and controlled manner, in efforts that are routinely employed to save lives and property; however

1.1.2.1. No level of risk to responders is acceptable in situations where there is no potential to save lives or property.

1.1.3. A higher level of risk is acceptable ONLY when there is a realistic potential to save known endangered lives.

1.1.3.1. This elevated risk shall be limited to operations that are specifically directed towards rescue and where there is a realistic potential to save person(s) known to be in danger.

This SOP has similar statements to the NFPA 1500 risk model and it can be utilized for procedure development. The Kalamazoo, Michigan, Fire Department (Coleman, 2007) summarizes their risk model with the following succinct statement; “We will risk lives in a calculated manner to save a life, take moderate risks to save property, and risk nothing to save life or property already

destroyed.” One additional department, Lancaster Fire Department, Texas (2002), has also issued a risk assessment general order. It states the following;

> All fire fighting and rescue operations involve inherent risks to fire fighters. A basic level of risk is recognized and accepted, in a measured and controlled manner, in efforts that are routinely employed to save lives and property. A higher level of risk is acceptable only in situations where there is a realistic potential to save endangered lives. This elevated risk must be limited to operations that are specifically directed toward rescue and where there is a realistic potential to save the person(s) in danger. These expanded risks are not acceptable in situations where there is no potential to save lives or property.

The International Association of Fire Chiefs (IAFC) has also issued risk models and risk analysis guidance and is available at their website (www.iafc.org). The first document was issued in 2001 and it outlines 10 rules of engagement (International Association of Fire Chiefs, 2001). It also contains risk statements, graphics, and a risk matrix that allows better understanding of risk concepts. A summary of this document is found in Appendix B.

A summary of the second IAFC risk analysis document is found in Appendix C. This draft was originally issued in 2009 and it provides more depth to the rules of engagement by offering more bullet points, more explanations, and even rules for incident commanders to follow regarding risk analysis (International Association of Fire Chiefs, 2010). For the purpose of this ARP, it does offer a freshly updated version of a risk model; “DO NOT risk your life for lives or property that cannot be saved, Extend limited risk to protect SAVABLE property, Extend Vigilant and Measured risk to protect and rescue SAVABLE lives.” These IAFC documents can be used for both policy and procedural development.

The IAFC also combined with the International City-County Management Association (ICMA) in 1986 to produce a system that encompasses risk assessment with the ultimate goal being continuous improvement for the fire service. This combined effort eventually created the Commission on Fire Accreditation International (CFAI) in 1996. CFAI’s mission (Commission on Fire Accreditation International, 2010) is to provide an accreditation process where fire agencies can compare their fire and emergency services delivery to a standard benchmark system. When fire departments can meet these benchmarks they can be accredited and as of 2008 only 128 fire departments have done so on a world-wide basis.

One of the goals of the accreditation process is to define the fire risks in the community and develop plans to address these issues (Commission on Fire Accreditation International, 2010). This risk assessment must be addressed in a Standards of Response Coverage Plan (SRCP). The risk assessment utilizes a matrix with the horizontal axis assessing the consequences of an event and the vertical axis assessing the probability of an event (Commission on Fire Accreditation International, 2010). While this analysis has merit for community planning purposes it does not meet the objectives of this ARP in its search for a simple risk model in which responders can access to assess risk at emergencies.

One last source of information on risk models was found in the training manual that the Madison Fire Department uses for its recruit academies. In the Essentials of Firefighting (2006) by the International Fire Service Training Association (IFSTA), risk management is discussed in Chapter 2. The section on risk management covers NFPA 1500 requirements that include a risk management plan and the criteria for risk assessment. The section also includes the following risk based principles that are based on NFPA 1500, Phoenix Fire Department policy, and the International Association of Fire Chief’s rules of engagement (International Fire Service Training Association, 2006);

-Activities that present a significant risk to the safety of members shall be limited to situations where there is a potential to save endangered lives.

-Activities that are routinely employed to protect property shall be recognized as inherent risks to the safety of members, and actions shall be taken to avoid these risks.

-No risk to the safety of members shall be acceptable when there is no possibility to save lives or property.

-When applying these principles, there are three key points to keep in mind:

-Team integrity is vital to safety and must always be emphasized.

-No property is worth the life of a firefighter.

-Firefighters should not be committed to interior offensive fire fighting operations in abandoned or derelict buildings that are known or reasonably believed to be unoccupied.

In summary, the literature review found several documents from a variety of sources such as trade magazine articles, professional books, state and federal regulations, national fire standards, and Internet sources such as fire department policies and procedures, and standard operating guidelines. All of these sources revealed good guidance on both risk model wording along

with supporting information that will benefit the development of a risk model policy and procedure.

Procedures

This action research was initiated by examining Madison Fire Department policy and procedures for the topic of risk models or similar statements regarding risk analysis. With none being found the applied research project was initiated in order to develop a risk model policy and procedure to better ensure responder safety but also to show leadership on this crucial issue. To start the ARP the first step was to conduct keyword searches for risk models while at the National Fire Academy's Learning Resource Center (LRC). Keyword searches included the terms associated with risk models and included risk analysis, risk assessment, risk/benefit analysis, and risk management. Searches included looking for trade magazine articles, published fire service books and manuals, state and federal regulations, applied research projects. Keyword searches of Internet sources were also conducted through www.google.com.

While at the LRC, and also at the fire service library of MATC several fire service books were also examined for the same key words as above. Several books and training manuals were found to contain information regarding risk and risk analysis.

To collect data from Madison Fire Department employees, the researcher developed and published a one question survey at

www.surveymonkey.com. The researcher subscribed to this on-line service in order to produce the questionnaire and gather the results. The purpose of the questionnaire was to gauge the overall awareness of a risk model that Madison Fire Department personnel had in order to assist with the need for a risk model policy and procedure. Personnel were alerted to this questionnaire through an internal email to the entire department. They were advised to click on the direct link to the Survey Monkey website and to accurately and honestly select their best reply to the question found in Appendix D. This single question was designed to be clear and concise in order to be answered quickly. They were also informed that the results of each questionnaire were entirely anonymous to help assure more truthful answers and that they needed to respond between May 15 and May 31, 2010. Results were tabulated and entered into a table for viewing.

As far as the research methodology, one assumption is that the data is given in good faith, it is accurate, and it is honest information. This applies to both the internal employee information as well as information from departments across the country. Lastly, the information from internal employees should be considered as a wide continuum in terms of knowledge and experience.

A phone interview with retired fire chief and author, Alan Brunacini was conducted on June 27, 2010. The first question asked of Brunacini was when did you first publish your risk model that starts with “we will risk a lot…”? The second question asked was what was the genesis for the NFA risk model? The conversation lasted 15 minutes and added information occurred in addition to the answers provided. After background research was completed both the problem statement and purpose of the research project was reviewed to make sure the ARP was on target.

Results

The research that was identified in the introduction was conducted and it resulted in the information that follows. The search for the keywords “risk/benefit analysis”, “risk vs. benefit models”, “risk assessment models”, “risk assessment”, “risk benefit”, “risk benefit model”, “risk-reward”, and “risk/benefit model”, yielded a total of 395 records. None of the documents, however, contained information on risk models as were described earlier. The term “rules of engagement” also yielded several documents that were reviewed as assistance for the procedural development of this ARP.

Research Question 1: What, if any, state or national guidelines address a risk model?

No mandated laws, regulations, or guidelines were found that required the use of a risk model for fire departments. This included State of Wisconsin laws for fire departments, found in Department of Workplace Development (1999) Chapter “Comm 30” for Fire Department Safety, and federal law found in OSHA code of federal regulations, namely, Chapter 29, Code of Federal Regulations (CFR), part 1910.156 for Fire Brigades (United States Department of Labor, 2010). Wisconsin Comm 30 does mention risk evaluation in Subchapter IX – Emergency Operations (30.14). It states under rescue of members, “At emergency operations, the officer in command shall evaluate the risks to fire fighters and, if necessary, request that at least basic life support personnel and patient transportation be available.”

Research Question 2: What, if any, private U.S. emergency services organization’s policy or procedures address a risk model?

Several risk models were found in National Fire Protection Association (NFPA) documents, namely NFPA 1500 (2007), 1521 (2008), and 1561 (2008). All risk models found consistently stated the following:

> NFPA 1500-8.3.2 The concept of risk management shall be utilized on the basis of the following principles:

(1) Activities that present a significant risk to the safety of members shall be limited to situations where there is a potential to save endangered lives.

(2) Activities that are routinely employed to protect property shall be recognized as inherent risks to the safety of members, and actions shall be taken to reduce or avoid these risks.

(3) No risk to the safety of members shall be acceptable when there is no possibility to save lives or property.

(4) In situations where the risk to fire department members is excessive, activities shall be limited to defensive operations.

The International Association of Fire Chiefs (2010) issued a document that outlines “rules of engagement” and also contains a fresh, updated, and comprehensive risk model along with pertinent material for procedural development. The risk model reads as; “DO NOT risk your life for lives or property that cannot be saved, Extend limited risk to protect SAVABLE property, Extend Vigilant and Measured risk to protect and rescue SAVABLE lives.”

Research Question 3: What, if any, private organization’s policy or procedures address a risk model?

The International Association of Fire Chiefs (IAFC) and the International City-County Management Association (ICMA) came together and produced an accreditation process that stressed continuous improvement for the fire service. This effort created the Commission on Fire Accreditation International (CFAI) with a mission to provide an accreditation process for fire agencies. Part of this process includes risk assessment. Fire departments that meet established benchmarks can become an accredited fire department.

One benchmark in the accreditation process defines the fire risks in the community and then and then requires plans that address these risks. This assessment is addressed in a Standards of Response Coverage Plan (SRCP) that uses a matrix that assesses the consequences of an event and also the probability of an event. This analysis does have merit for community planning purposes but it does not meet the objectives of this ARP in its search for a simple risk model for which responders can access to assess risk at emergencies.

Several other private sources were found to have risk models also such as Dodson (1999); “Risk a life to save a life. Take a calculated and weighted risk to save valued property. Take no risk to save what is lost.” Brunacini (2002) also has a risk model; “We will risk a lot to protect a savable life, We will risk a little to protect savable property, We will not take

any risk to protect lives or property that are already lost." Brunacini (2006) also offered a subsequent risk model; "We will take a significant risk to protect a savable life, a little very controlled risk to protect savable property, no risk for what is already lost." In the book, Firefighting Strategies and Tactics (2001), the authors offer this risk model; "We will risk a lot to save a lot, We will risk little to save a little, We will risk nothing to save nothing."

Research Question 4: What, if any, public U.S. emergency service organizations address risk models in their policy and procedure?

The National Fire Academy (NFA) has identified a risk model that they call their risk vs. reward model and they cite in their course manuals. It simply reads "Risk a lot to save a lot, Risk a little to save a little, and Risk nothing to save nothing." (Marsar, 2009). Several fire departments across the United States were found that address risk management and actually have risk models. While there were many variations the general theme was found to be remarkably similar to the NFA's.

Phoenix (Arizona) Fire Department (2001) has a comprehensive risk model that call a "risk management profile" as follows; "We Will risk our lives a lot, in a calculated manner, to save SAVABLE lives, We Will risk our lives a little, in a calculated manner, to save SAVABLE property, We Will Not risk our lives at all for lives or property that are already Lost."

The Fulton County, Georgia, Fire Department (2003) was found to have a risk model called “rules of engagement”. This standard operating procedure states the following;

1.1.1. No property is worth the life of a member of the Fire Department.

1.1.1.1. Fire department members shall NOT be committed to interior firefighting operations in any structure that is obviously abandoned, derelict, known or reasonably believed to be unoccupied.

1.1.1.2. Fire department members shall NOT make entry into a hazardous environment without the material or substance being identified for other than life saving purposes and then only with appropriate training and equipment.

1.1.1.3. Fire department members shall NOT make entry into an unshored collapsed structure or trench for other than immediately life safety reasons, and then only with appropriate training and equipment.

1.1.2. A basic level of risk is recognized and accepted, in a measured and controlled manner, in efforts that are routinely employed to save lives and property; however

1.1.2.1. No level of risk to responders is acceptable in situations where there is no potential to save lives or property.

1.1.3. A higher level of risk is acceptable ONLY when there is a realistic potential to save known endangered lives.

1.1.3.1. This elevated risk shall be limited to operations that are specifically directed towards rescue and where there is a realistic potential to save person(s) known to be in danger.

The Kalamazoo, Michigan, Fire Department (Coleman, 2007) was found to have a brief risk model; “We will risk lives in a calculated manner to save a life, take moderate risks to save property, and risk nothing to save life or property already destroyed.” The City of Lancaster, Pennsylvania, Fire Department (2002) was found to have a risk model. It states the following;

> All fire fighting and rescue operations involve inherent risks to fire fighters. A basic level of risk is recognized and accepted, in a measured and controlled manner, in efforts that are routinely employed to save lives and property. A higher level of risk is acceptable only in situations where there is a realistic potential to save endangered lives. This elevated risk must be limited to operations that are specifically directed toward rescue and where there is a realistic potential to save the person(s) in danger. These expanded risks are not acceptable in situations where there is no potential to save lives or property.

Research Question 5: What, if any, is the Madison, Wisconsin, Fire Department's conception and application of a risk model?

Madison Fire Department personnel were asked through an inter-departmental email the following question: In both your daily fire department work, along with any emergency response operations (including firefighting, EMS, specialty responses), how often do you consider or think about the following risk statements/rules of engagement statements?; We will risk a lot to save a lot, We will risk a little to save a little, We will risk nothing to save nothing. This statement utilizes the National Fire Academy risk model.

Out of 194 responses the breakdown is as follows: 1.6% (3 responses) stated that they never consider the above statements. 11.9% (23 responses) stated that they seldom, (a few times per year) consider the above statements. 30.4% (59 responses) stated that they occasionally (a few times per month) consider the above statements. 38.1% (74 responses) stated that they frequently (a few times per day) consider the above statements. 18.0% (35 responses) stated that they always (on every work activity and response) consider the above statements. The following table also shows the results.

Table 1

Risk model consideration frequency by MFD personnel

	Percentages and Numbers out of 194 Personnel	
Frequency Statement	Percentage Response	Number of Response
Never consider	1.6%	3
Seldom consider	11.9%	23
Occasionally consider	30.4%	59
Frequently consider	38.1%	74
Always consider	18.0%	35
Total	100%	194

Response to this question amounted to 57.6% of all employees and the assumption is made that the responses are honest and accurate. From the responses, a total of 43.9% only consider risk models a few times a month or less in their fire department activities. When the group who thinks of risk models a few times a day is added the total is 82%. This represents a large group of employees who do not seem to reflect on a risk model very often. Even when the personnel who do consider risk models frequently (more than twice per day) the total is only 56.1%. In summary, a little more than half of the department responded to

the question and a little more than half of them think of a risk model in their fire department activities.

Discussion

The research indicates that there are many risk models by several sources but the essence of these models is very much the same. Research found that one source is NFPA 1500 (2007) and was originally published in 1987. Risk models that were found to closely resemble NFPA 1500 include Dodson's (1999) long version, the International Fire Service Training Association (2006), Fulton County Fire Department (2003), and the Lancaster Fire Department (2002).

Research also found that numerous risk models also modeled themselves after the Phoenix Fire Department's (Coleman, 2001) risk model that was originally issued in 1986. They include: Dodson's (1999) shortened version, Firefighting Strategy and Tactics (Angle, 2001), Kalamazoo Fire Department (Coleman, 2001), the National Fire Academy (Marsar, 2009) and the International Association of Fire Chiefs (2010).

Because of this research, it appears that the genesis for both the NFPA 1500 and Phoenix Fire Department's risk models, however, came from one man's influence. That man is the former fire chief of the Phoenix Fire Department, Alan V. Brunacini. Not only did he have a great deal of influence on his own fire

department he also wrote fire service books concerning many topics and especially firefighter safety. Among the material in his popular and influential books were risk management concepts including risk models.

Brunacini also lectured and taught his material on incident command, decision making, firefighter safety, and risk management concepts on a national basis. Additionally, Brunacini chaired the NFPA committee that developed the 1500 Firefighter Health and Safety standard that was first published in 1987. With that position he also introduced his risk model and associated risk assessment statements into the published standard. With 48 years of active fire service experience, Brunacini’s legacy in the area of firefighter safety has proven to be absolutely monumental.

In light of all of this information and the Brunacini influence, all of the other risk models developed for and about the fire service appear to be complimentary knock-offs or derivations of Brunacini’s early work. It is clear that since his early work, being published in 1984, virtually all other references to risk models, especially the succinct statement types, such as NFPA 1500 and the NFA course risk models can all be credited to Brunacini’s (2002) risk model. Any and all of this material can be utilized for policy and procedure

development for the Madison Fire Department. Material found that augments the risk model information can also add to the procedural information found within the rules of engagement statements and concepts. Again, much of this work has also been strongly influenced by Brunacini. Perhaps the most current and comprehensive risk model that builds upon Brunacini's work has been recently issued by the International Association of Fire Chiefs (2010).

What this means for the Madison Fire Department is that a comprehensive risk model policy and procedure can be developed that can provide an excellent platform for personnel to use while on emergencies. In light of this fact, it is almost embarrassing to realize that this policy and procedure has been developed based on 25 year old concepts and risk model statements. The implications of issuing this risk model policy and procedure is that now all personnel can be consistently trained on proper use of a risk model and its associated statements. On future responses personnel can compare the situation at hand with the risk model and then make appropriate decisions with their tactical approach. This new risk model can also have an effect of slowing personnel down while they consider the risk involved in any emergency. The completed risk model policy and procedure is found in Appendix E.

Recommendations

Because firefighting is dangerous and risk adverse, all firefighters should avoid blindly and aggressively responding to emergencies without first analyzing the risk. Therefore, it would behoove the Madison Fire Department to issue a policy and procedure that identifies a risk model for fire personnel to use to assess risk and then make appropriate response decisions (see appendix E). This research supports a risk model policy and procedure that has several positive actions with one being that personnel should have a much better concept of whether their involvement is warranted because of this risk assessment. This risk model should also help to slow personnel down due to conducting the assessment. Finally, this risk model should help to save firefighter lives and reduce injuries because of the risk assessment.

The MFD challenges all of its members to lead with innovative thinking and in setting the standard with effective approaches to emergency services (Madison Fire Department, 2006). If the department does not rest on its laurels and truly does confront change head on, then these recommendations will be carefully considered, an implementation plan will be developed, and the recommendation will be initiated without delay. Francis Brannigan (2008), a fire service educator from years past once

said, “You can’t protect the public if you can’t protect yourself”. His words are especially applicable with the concept of providing firefighters with a risk model that they can access at emergencies. Additionally, Ben Klaene (2006), a retired fire chief from Cincinnati once said, “Applying risk management to fireground operations is essential if we are to reduce the number of firefighter fatalities”. The old master himself, Brunacini (1985), once said, “There is a fine line between being aggressive and being stupid!” Both of their wise statements point to the power of thinking as a safety measure. Finally, Dodson (1999) stated, “Knowledge, sound judgment, experience, and wisdom are paramount in making risk decisions.”, another insightful comment about the effectiveness of a risk model.

Being smart, and wise, and slowing down, is the key to staying alive and the modern firefighter will do well to realize these concepts to their advantage. Using a comprehensive risk model on all emergencies in order to make good, sound, risk-based tactical decisions is prudent. In the future, for the Madison Fire Department, risk model usage should be the norm and future training sessions should reinforce this new policy and procedure. In this way, fire personnel can hope to be safer and avoid being another statistic in the high-risk endeavor of emergency response.

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Appendix A

Summary of Firefighter Line-of-Duty-Death Benefits

This summary is based on a full-time firefighter Line-of-Duty-Death (LODD) in the State of Wisconsin. The benefits vary state to state across the country. This summary also does not include insurance benefits, social security benefits, Veteran's benefits, or benefits based on various association memberships. The source of this information is from www.nationalfirefighterfoundation.com.

1. Department of Justice-Public Safety Office's Benefits (PSOB). As of October 1, 2009 the LODD benefit is $311,810.
2. State of Wisconsin LODD Benefit is 4 X annual earnings X 75%. If an assumption of annual earnings of $80,000 is made the total is $240,000.
3. Wisconsin Worker's Compensation LODD benefit is 4 X annual earnings with a maximum of $213,300.
4. Wisconsin LODD Funeral Benefit is $6,000.
5. Wisconsin LODD Retirement Fund Benefit can be paid by lump sum or an annuity. If the age at time of death is under 50 the benefit is 2 times the balance. In this situation the total amount would be approximately $600,000.
6. Education Benefit for LODD is no tuition or material fees for children under 21 years old or for a spouse. This

benefit is for up to 5 years of consecutive attendance at a University of Wisconsin system school. This benefit amounts to approximately $90,000 for each survivor. The assumption here is one survivor benefit.

7. The total for all of the above benefits would be a minimum of $1,461,110.for a firefighter LODD in the State of Wisconsin.

Appendix B

Summary of IAFC's 10 Rules of Engagement (2001)

Acceptability of Risk

1. No building is worth the life of a fire fighter.
2. All interior fire fighting involves an inherent risk.
3. Some risk is acceptable in a measured and controlled manner.
4. No level of risk is acceptable where there is no potential to save lives or savable property.
5. Fire fighters shall not be committed to interior offensive fire fighting operations in abandoned or derelict buildings.

Risk Assessment

1. All feasible measures shall be taken to limit or avoid risks through risk assessment by a qualified officer.
2. It is the responsibility of the Incident Commander to evaluate the level of risk in every situation.
3. Risk assessment is a continuous process for the entire duration of each incident.
4. If conditions change, and risk increases, change strategy and tactics.
5. No building or property is worth the life of a fire fighter.

Appendix C

Expanded Summary of 10 Rules of Engagement (2010)

Rules of Engagement for Firefighter Survival

-Size-Up Your Tactical Area of Operation.

-Determine the Occupant Survival Profile.

-DO NOT Risk Your Life for lives or property that cannot be saved.

-Extend ***LIMITED*** Risk to Protect **SAVABLE** Property.

-Extend Vigilant and Measured Risk to Protect and Rescue **SAVABLE** Lives.

-Go in together, Stay together, Come out together

-Maintain Continuous Awareness of your air supply, situation, location, and fire conditions.

-Constantly monitor fireground communications for critical radio reports.

-You Are Required to report Unsafe Practices or Conditions that can harm you. Stop, Evaluate, and Decide.

-You Are Required to Abandon Your Position and Retreat before deteriorating conditions can harm you.

-Declare a May-Day as soon as you think you are in danger.

The Incident Commander's Rules of Engagement for Structural Firefighting

-Rapidly Conduct, or Obtain, a 360 Degree Size-Up of the Incident.

-Determine the Occupant Survival Profile.

-Conduct an Initial Risk Assessment and Implement a **SAFE ACTION PLAN.**

-If You Do Not Have The Resources to safely support and Protect Firefighters – seriously consider a defensive strategy.

-Extend ***LIMITED*** Risk to Protect **SAVABLE** Property.

-Extend Vigilant and Measured Risk to Protect and Rescue **SAVABLE** Lives.

-Firefighters are required to report unsafe practices and conditions that can harm them. Stop, Evaluate, and Decide.

-Maintain frequent two-way communications and keep interior crews informed of changing conditions.

-Obtain frequent progress reports and revise the action plan.

-Maintain accurate accountability of all firefighter location and status.

-Upon completion of the primary search and little or no progress towards fire control has been achieved – seriously consider a defensive strategy.

-Always Have a Rapid Intervention Team in Place.

Appendix D

Question posed to MFD Personnel

Madison Fire Department personnel were asked through an inter-departmental email the following question: In both your daily fire department work, along with any emergency response operations (including firefighting, EMS, specialty responses), how often do you consider or think about the following risk statements/rules of engagement statements?; We will risk a lot to save a lot, We will risk a little to save a little, We will risk nothing to save nothing.

Choices for response:

Never	(never consider risk or the above statements)
Seldom	(maybe a few times per year)
Occasionally	(maybe a few times per month)
Frequently	(maybe a few times per day)
Always	(on every work activity and response)

Appendix E

Madison Fire Department

Risk Model

Policy and Procedure

Purpose

Emergencies of all types are inherently dangerous because of the unsettled nature of the incident. The hazards and risks to emergency responders are abundant and injuries and death are a very real possibility for all fire department personnel. The purpose of this policy and procedure is to provide as safe a working environment as possible for all department personnel through an administrative control. In order to address risk at each emergency, and in order to minimize risk to each responder, all personnel are expected to consider and operate with the following risk model in mind;

DO NOT Risk Your Life for Lives or Property That Can Not Be Saved.

Extend ***LIMITED*** Risk to Protect **SAVABLE** Property.

Extend **Vigilant** and **Measured** Risk to Protect and Rescue **SAVABLE** Lives.

Source: International Association of Fire Chiefs - Rules of Engagement for Firefighter Survival

Benefits

This risk model is a type of risk management profile that needs to be applied to all emergency incidents. It also needs to be continuously re-assessed throughout the incident in order to maintain maximum benefit. The goal of all incidents is to maintain life safety of all responders and all affected people in addition to incident stabilization and property conservation.

Application

The following are the firefighting rules of engagement that augment and compliment the risk model from above.

Rules of Engagement for Firefighter Survival

Size-Up Your Tactical Area of Operation.

Determine the Occupant Survival Profile.

DO NOT Risk Your Life for Lives or Property That Can Not Be Saved.

Extend ***LIMITED*** Risk to Protect **SAVABLE** Property.

Extend **Vigilant** and **Measured** Risk to Protect and Rescue **SAVABLE** Lives.

Go in Together, *Stay Together*, Come Out Together

Maintain Continuous Awareness of Your Air Supply, Situation, Location and Fire

Conditions.

Constantly Monitor Fireground Communications for Critical Radio Reports.

You Are Required to Report Unsafe Practices or Conditions That Can Harm You. Stop, Evaluate and Decide.

Your Are Required to Abandon Your Position and Retreat Before Deteriorating Conditions Can Harm You.

Declare a May Day As Soon As You THINK You Are in Danger.

The Incident Commanders Rules of Engagement for Structural Firefighting

Rapidly Conduct, or Obtain, a 360 Degree Size-Up of the Incident.

Determine the Occupant Survival Profile.

Conduct an Initial Risk Assessment and Implement a **SAFE ACTION PLAN.**

If You Do Not Have The Resources to Safely Support and Protect Firefighters – Seriously Consider a Defensive Strategy.

DO NOT Risk Firefighter Lives for Lives or Property That Can Not Be Saved – Seriously Consider a Defensive Strategy.

Extend ***LIMITED*** Risk to Protect **SAVABLE** Property.

Extend **Vigilant** and **Measured** Risk to Protect and Rescue **SAVABLE** Lives.

Firefighters Are Required to Report Unsafe Practices and Conditions That Can Harm Them. Stop, Evaluate and Decide.

Maintain Frequent Two-Way Communications and Keep Interior Crews Informed of Changing Conditions.

Obtain Frequent Progress Reports and Revise the Action Plan.

Maintain Accurate Accountability of All Firefighter Location and Status.

Upon Completion of the Primary Search and Little or No Progress Towards Fire Control Has Been Achieved - Seriously Consider a Defensive Strategy.

Always Have a Rapid Intervention Team in Place.

Source: International Association of Fire Chiefs - Rules of Engagement for Firefighter Survival